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IRON ORES - DETERMINATION OF LEAD AND ZINC BY ATOMIC ABSORPTION

STATISTICAL EVALUATION OF INTERNATIONAL TEST DATA - 1982

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IRON ORES - DETERMINATION OF LEAD AND ZINC BY ATOMIC ABSORPTION STATISTICAL ANALYSIS OF INTERNATIONAL TEST DATA - 1982

by

R. Sutarno* and W.S. Bowman**

SUMMARY

The analytical data collected from the preliminary international test conducted by ISO/TC 102/SC 2/WG 14B on the determination of lead and zinc contents in iron ores by atomic absorption during the period of 1980-1982 have been statistically evaluated.

It was found that the preliminary estimates of the precisions can be expressed in terms of the lead and zinc contents in the samples by the following linear equations:

Lead	Zinc
$r = 0.0332\ X + 0.0004$	$r = 0.0415\ X + 0.0011$
$P = 0.0587\ X + 0.0028$	$P = 0.1048\ X + 0.0030$
$\sigma_r = 0.0117\ X + 0.0001$	$\sigma_r = 0.0147\ X + 0.0004$
$\sigma_L = 0.0190\ X + 0.0010$	$\sigma_L = 0.0355\ X + 0.0010$

where r is the repeatability, P is the permissible tolerance, σ_r is the within-laboratories standard deviation, σ_L is the between-laboratories standard deviation, and X is the lead or zinc content in the sample, all in weight per cent.

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INTRODUCTION

These analytical data were collected from the international test conducted by ISO/TC 102/SC 2/WG 14B (successor of IWG 13) on the determination of lead and zinc in iron ores by atomic absorption method during the period 1980-1982. This international test was the continuation of the preliminary test conducted previously by IWG 13 during 1978-1980, using basically the same analytical procedure taking into account the comments made at the tenth meeting of the subcommittee[1],[2],[3]. In this international test, twenty-two laboratories provided analytical results. Most of them analysed two bottles of sample of each ore in duplicate. Five test samples with lead contents ranging from 0.001 to 0.32% and zinc contents from 0.002 to 0.48% were used. These test samples are the same as those used for the previous international test.

PRINCIPLE OF THE ANALYTICAL METHOD

The test portion is decomposed and silica removed by treatment with hydrochloric acid and hydrofluoric acid. Oxidation is with with nitric acid.

The solution is evaporated to dryness, followed by dilution and filtration. The filtrate solution is reserved. The residue is ignited and fused with sodium carbonate. The cooled melt is dissolved with hydrochloric acid.

Iron is extracted in the filtrate with MIBK along with the lead and zinc. The MIBK is decomposed with nitric acid. The solution is evaporated to dryness and the residue is dissolved with the reserved solution and hydrochloric acid.

The solution is aspirated into the flame of an atomic absorption spectrometer with an air-acetylene burner for the determination of both lead and zinc.

Absorbance values obtained for lead and zinc are compared with those obtained from calibration solutions.

STATISTICAL EVALUATION

The data were statistically evaluated by the procedure described in document ISO/TC 102/SC 2 (WG 7-21) N 532 E[4] (multiplying factor of 2.77 has been changed to 2.83-Appendix A). This procedure is schematically illustrated in Figure 1. The raw data are presented graphically in Figures 2. The boxed points in Figures 2 signify that these data were suspected outliers and were excluded from computation. Explanation of these suspected outliers is presented in the detailed computation in Appendix B. The results of this computation are summarized in Tables 1. The precisions estimated are plotted against their corresponding concentration in Figures 3. The linear regressions of these plots are presented in Tables 1. Comparison of the grand means and their confidence intervals obtained from this international test and those obtained from previous tests are presented in Table 3. The comparison for the precisions are in Table 4. Table 2 lists the suspected outliers and the ratio between the between-laboratories and the within-laboratory standard deviation. These can be used as a measure of the degree of the standardization of the method.

OBSERVATIONS

From the above evaluation, the following are observed:

(a) Accuracy - the accuracy of the method seems to be consistant. Although Table 3 shows that the grand means for zinc obtained from the present international test are higher than the previous test, the difference is, in most cases, statistically insignificant. The exception being the grand mean for zinc of sample 76-16 where the results of the previous test were erratic[5].

(b) Precision - Table 1 shows that in general the precision seems to be acceptable for the concentration level of the sample. Table 4 shows that the permisible tolerance estimated from the present test seems

to be greater than that of the previous test. This may be caused by the increase in the number of participating laboratories who were not participating at the A-stage of development.

(c) Outliers and σ_L/σ_r Ratios - Table 2 shows that both the number of outliers and the σ_L/σ_r ratios are rather high; some laboratories reporting outliers for several samples. This perhaps indicates that there is still room for improvement in the standardization of the analytical method.

REFERENCES

1. "The tenth meeting of ISO/TC 102/SC 2 - Iron ores/Chemical analysis, Pretoria October 1980"; ISO/TC 102/SC 2 (Sect.-214) N 655 E; August 1981.

2. "Report of IWG 13 - Determination of lead and zinc in iron ores"; ISO/TC 102/SC 2 (IWG 13-5) N 613 E; September 1980.

3. "Iron ores - Determination of lead and zinc content- atomic absorption spectrometric method (Sixth draft)"; ISO/TC 102/SC 2 (WG 14B-2); November 1981.

4. "Procedure for statistical evaluation of analytical data resulting from international tests"; ISO/TC 102/SC 2 (WG 7-21) N 532 E; August 1978.

5. "Iron ores - Determination of lead and zinc by atomic absorption method - statistical analysis of international test data", R. Sutarno and W.S. Bowman; Division Report MRP/MSL 81-149 (IR); CANMET, Energy, Mines and Resources Canada; January 1982.

Table 1.1

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - LEAD

SUMMARY OF PRECISIONS FOR ALL SAMPLES

SAMPLE	MEAN(X)	REPEATABILITY	PERMISSIBLE TOLERANCE	SIGMA-R	SIGMA-L
76-16	.0015	.0004	.0014	.00014	.00049
76-21	.0014	.0005	.0015	.00018	.00051
79-1	.0975	.0035	.0143	.00124	.00498
79-13	.0066	.0007	.0021	.00024	.00071
80-1	.3195	.0110	.0198	.00389	.00644

THE REGRESSION EQUATIONS ARE:					CORR. COEFF.
R	=	.0332 X	+	.0004	.9998
P	=	.0587 X	+	.0028	.9276
SIGMA-R	=	.0117 X	+	.0001	.9998
SIGMA-L	=	.0190 X	+	.0010	.9097

Table 1.2

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC

SUMMARY OF PRECISIONS FOR ALL SAMPLES

SAMPLE	MEAN(X)	REPEATABILITY	PERMISSIBLE TOLERANCE	SIGMA-R	SIGMA-L
76-16	.0016	.0006	.0016	.00020	.00055
76-21	.0099	.0011	.0029	.00038	.00097
79-1	.1398	.0074	.0231	.00261	.00794
79-13	.4778	.0205	.0521	.00722	.01769
80-1	.1649	.0093	.0184	.00327	.00608

THE REGRESSION EQUATIONS ARE:					CORR. COEFF.
R	=	.0415 X	+	.0011	.9947
P	=	.1048 X	+	.0030	.9887
SIGMA-R	=	.0147 X	+	.0004	.9947
SIGMA-L	=	.0355 X	+	.0010	.9870

Table 2 - List of outliers and ratio of the between-laboratories standard deviation σ_L to the within-laboratories standard deviation σ_r

Sample	Mean	K_o	N_o	K	N	Outliers			σ_L/σ_r
						Cochran (precision)	Dixon (accuracy)	Individual result	
Lead									
76-16	0.0015	22	85	17	68	CND 1 FR 2 IT 2 USA 1 USA 2	—	—	3.5
76-21	0.0014	22	86	19	74	FR 2 USA 1 USA 2	—	—	2.8
79-1	0.0975	21	82	15	60	CND 1 FR 2 IND 1 IND 2 IT 2 JP 2	—	—	4.0
79-13	0.0066	22	85	20	78	FR 2 USA 2	—	—	3.0
80-1	0.3195	18	72	16	64	JP 2 USA 2	—	—	1.7
Zinc									
76-16	0.0016	22	85	18	70	AU 4 USA 1 USA 2	CDN 1	—	2.8
76-21	0.0099	22	86	17	65	AU 1 AU 4 FR 1 FR 2 FR 4	—	USA 1	2.6
79-1	0.1398	22	85	17	68	AU 1 FR 1 IT 2 USA 1 USA 2	—	—	3.0
79-13	0.4778	22	85	19	73	AU 4 CDN 1 USA 1	—	—	2.4
80-1	0.1649	18	72	18	72	—	—	—	1.9

* See appendix A for abbreviation.

Table 3 - Comparison between the grand means estimated from the results of international tests conducted during the period of 1978-1980 and 1980-1982

Sample	Grand Mean 1980 95% Confidence Intervals			Grand Mean 1982 95% Confidence Intervals		
	Low %	$\bar{x}$ %	High %	Low %	$\bar{x}$ %	High %
Lead						
76-16	0.00103	0.00143	0.00182	0.00129	0.00154	0.00179
76-21	0.00105	0.00140	0.00174	0.00118	0.00143	0.00168
79-1	0.09656	0.09954	0.10251	0.09482	0.09750	0.10018
79-13	0.00624	0.00649	0.00673	0.00623	0.00657	0.00690
80-1*	0.31478	0.31850	0.32223	0.31595	0.31954	0.32313
Zinc						
76-16	0.00063	0.00089	0.00117	0.00129	0.00157	0.00185
76-21	0.00854	0.00893	0.00933	0.00934	0.00986	0.01038
79-1	0.13046	0.13872	0.14699	0.13565	0.13978	0.14392
79-13	0.44358	0.46110	0.47862	0.46906	0.47783	0.48661
80-1**	0.15692	0.16018	0.16344	0.16181	0.16494	0.16807

* Euro certificate value = 0.317% ± 0.004% Pb

** Euro certificate value = 0.165% ± 0.002% Zn

Table 4. Comparison between the precision estimated from the results of international tests conducted during the period of 1978-1980 and 1980-1982

Sample	r%		P%		σ_r%		σ_L%	
	1980	1982	1980	1982	1980	1982	1980	1982
Lead								
76-16	0.00075	0.00039	0.00134	0.00141	0.00027	0.00014	0.00044	0.00049
76-21	0.00077	0.00051	0.00117	0.00148	0.00027	0.00018	0.00037	0.00051
79-1	0.00455	0.00351	0.00902	0.01432	0.00164	0.00124	0.00304	0.00498
79-13	0.00088	0.00067	0.00087	0.00206	0.00032	0.00024	0.00022	0.00071
80-1	0.01620	0.01102	0.01380	0.01983	0.00585	0.00389	0.00280	0.00644
Zinc								
76-16	0.00036	0.00056	0.00090	0.00161	0.00013	0.00020	0.00031	0.00055
76-21	0.00103	0.00107	0.00134	0.00286	0.00037	0.00038	0.00041	0.00097
79-1	0.00408	0.00738	0.02460	0.02306	0.00147	0.00261	0.00882	0.00794
79-13	0.01556	0.02045	0.05245	0.05210	0.00562	0.00722	0.01851	0.01769
80-1	0.00522	0.00926	0.01090	0.01841	0.00188	0.00327	0.00372	0.00608

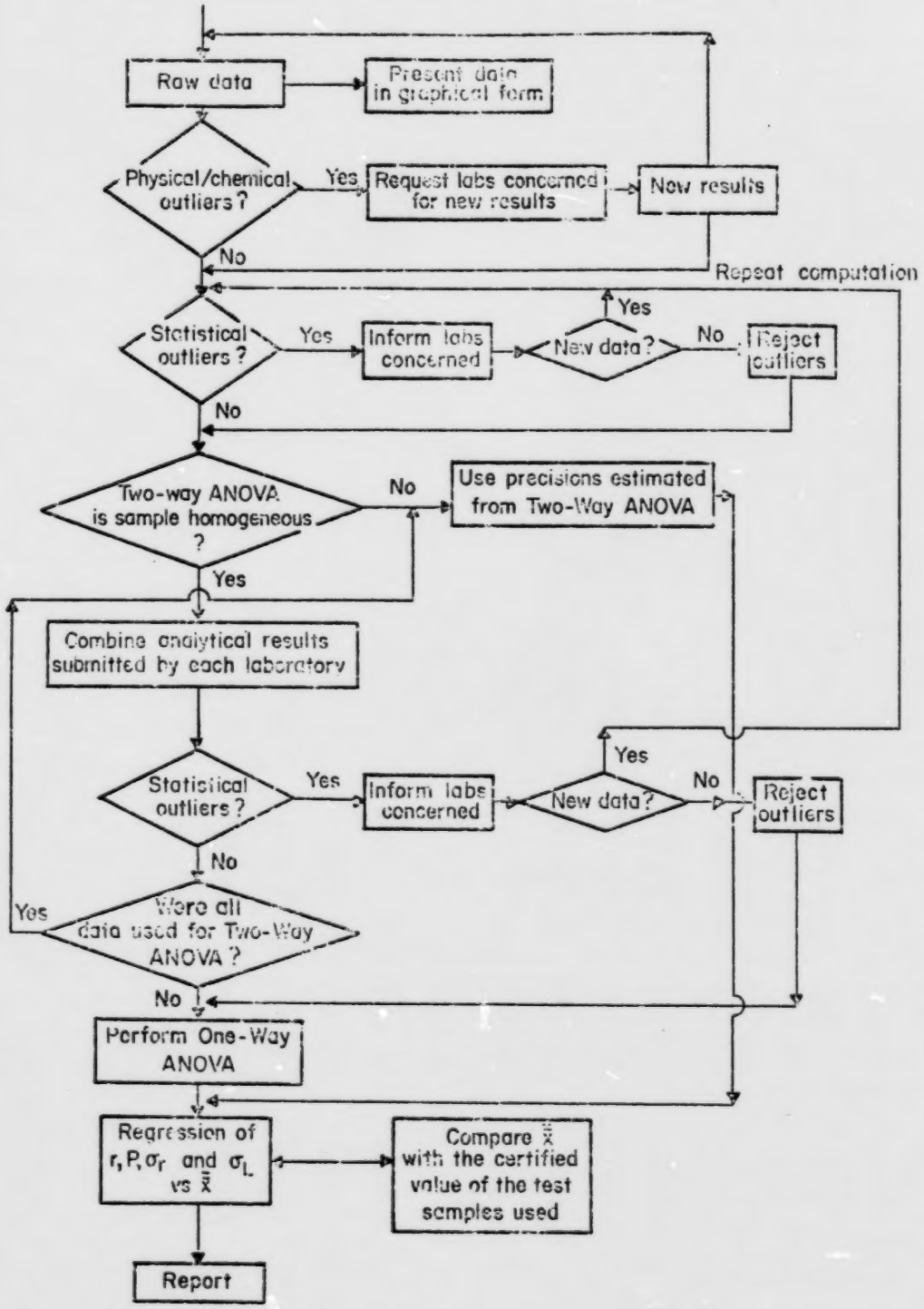
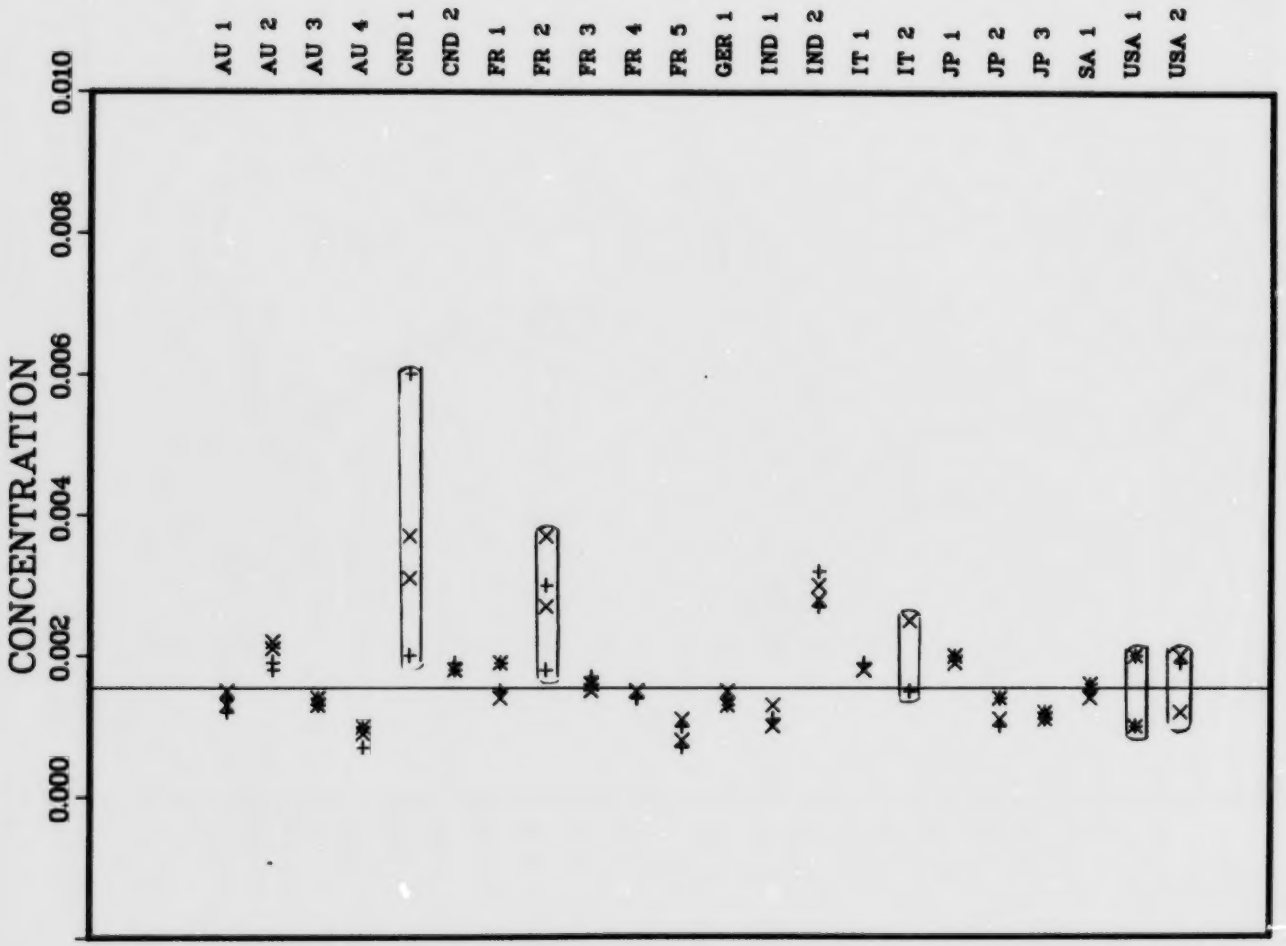


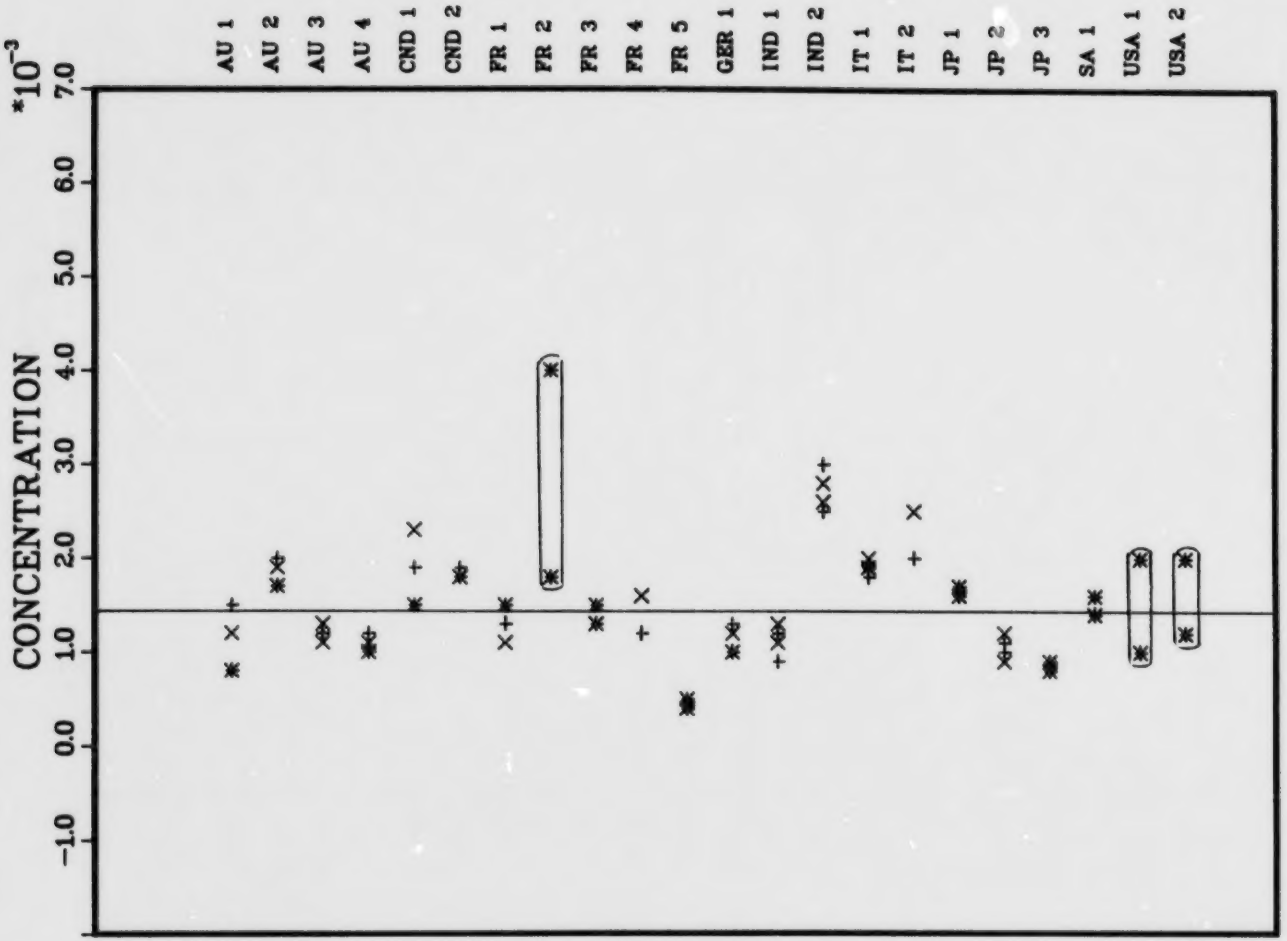
Figure 1. Schematic diagram of the procedure for statistical evaluation.



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – LEAD

SAMPLE: 76–16 (SISHEN IRON ORE)

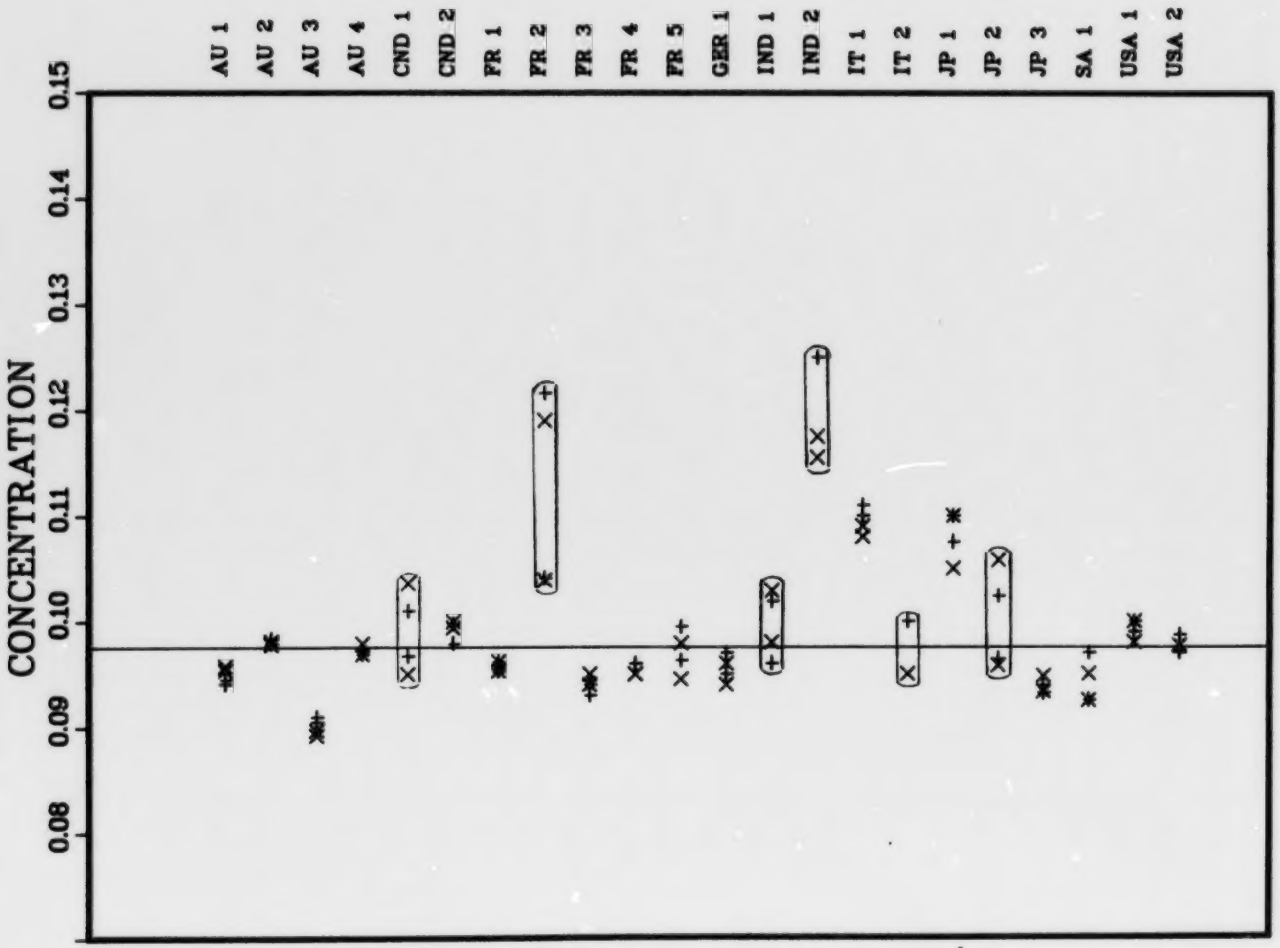
Figure 2.1



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – LEAD

SAMPLE: 76–21 (ROBE RIVER)

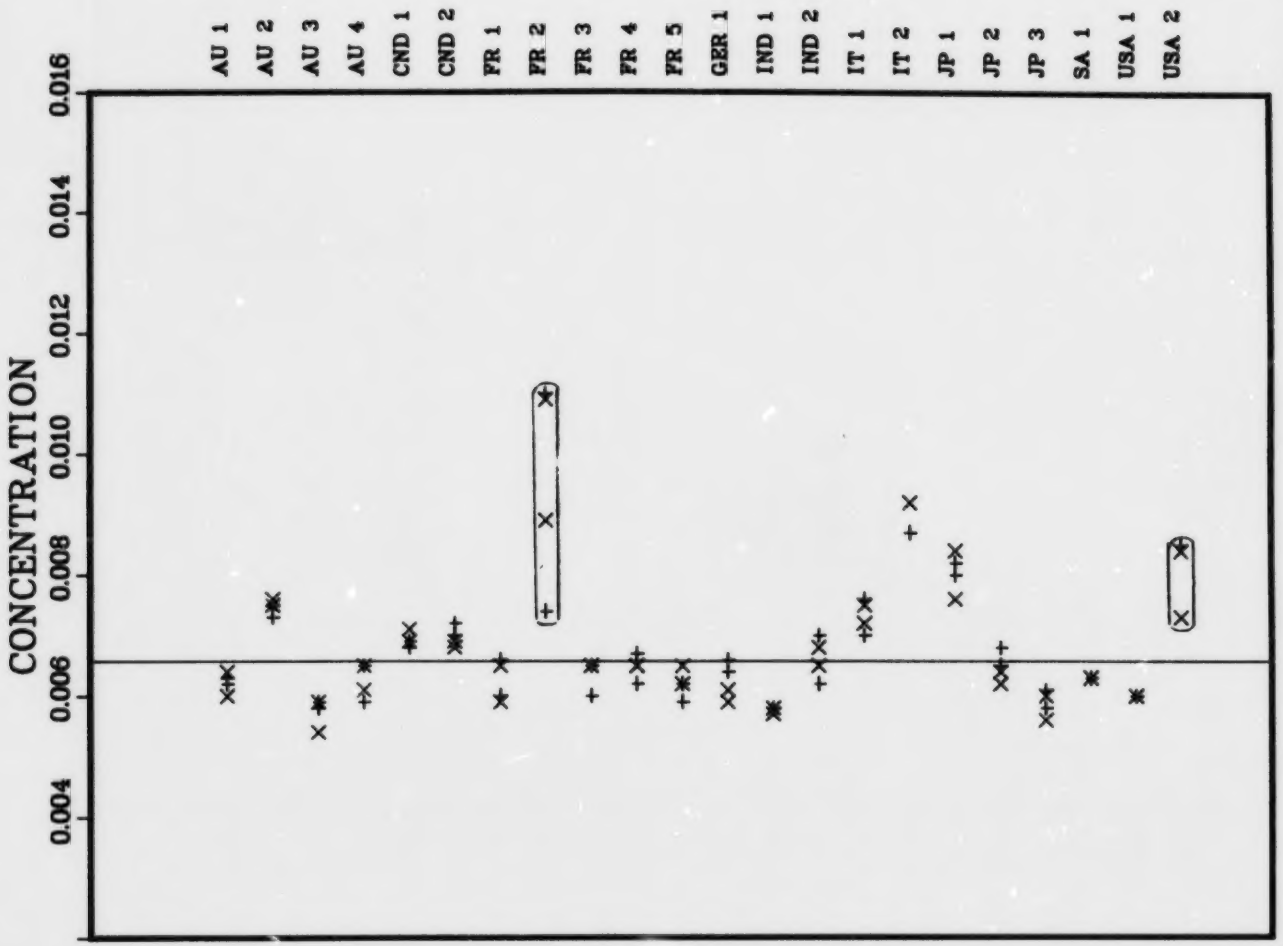
Figure 2.2



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – LEAD

SAMPLE: 79-1 (STOLLBERG)

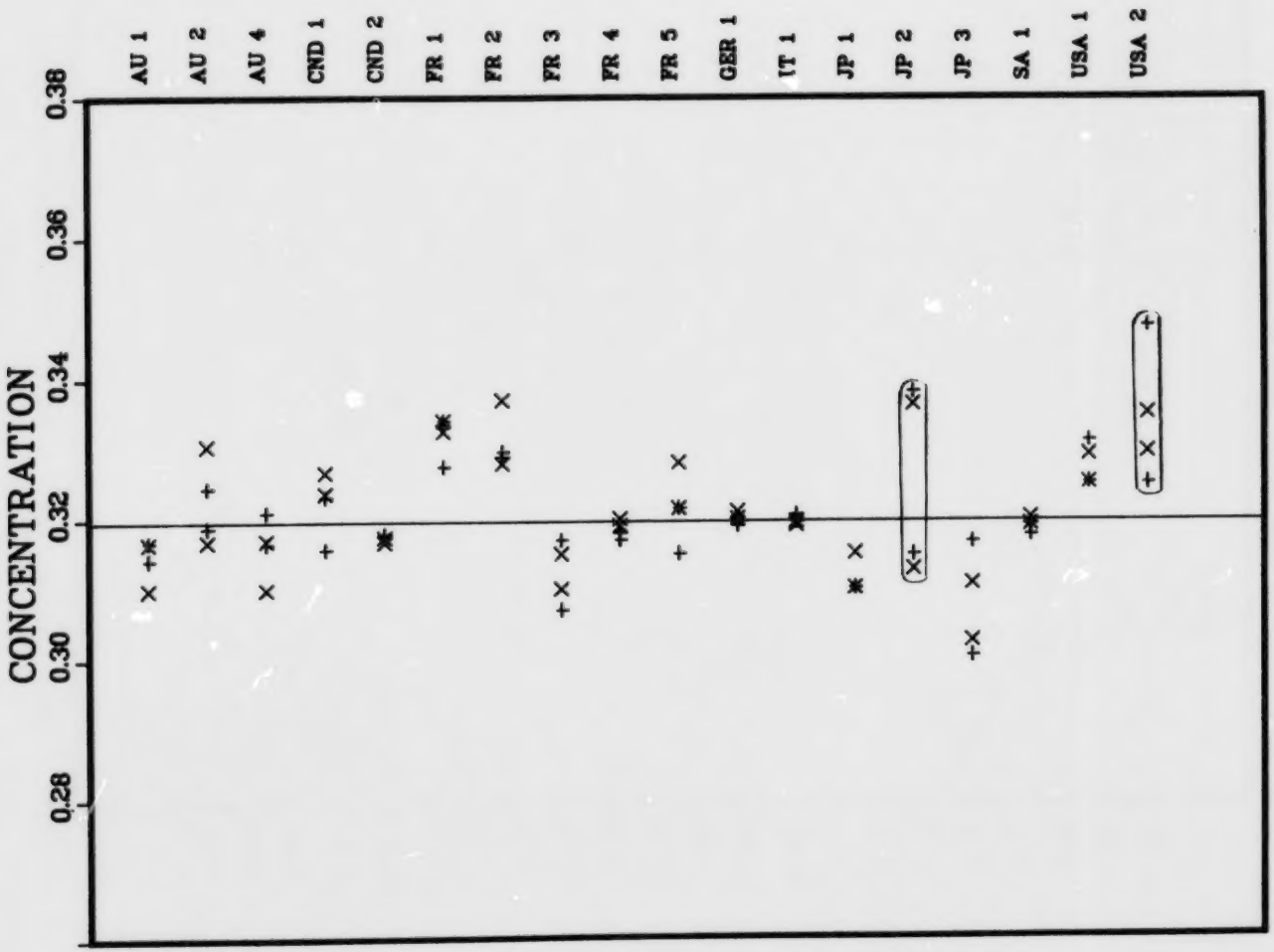
Figure 2.3



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – LEAD

SAMPLE: 79-13 (WHYALLA ORE)

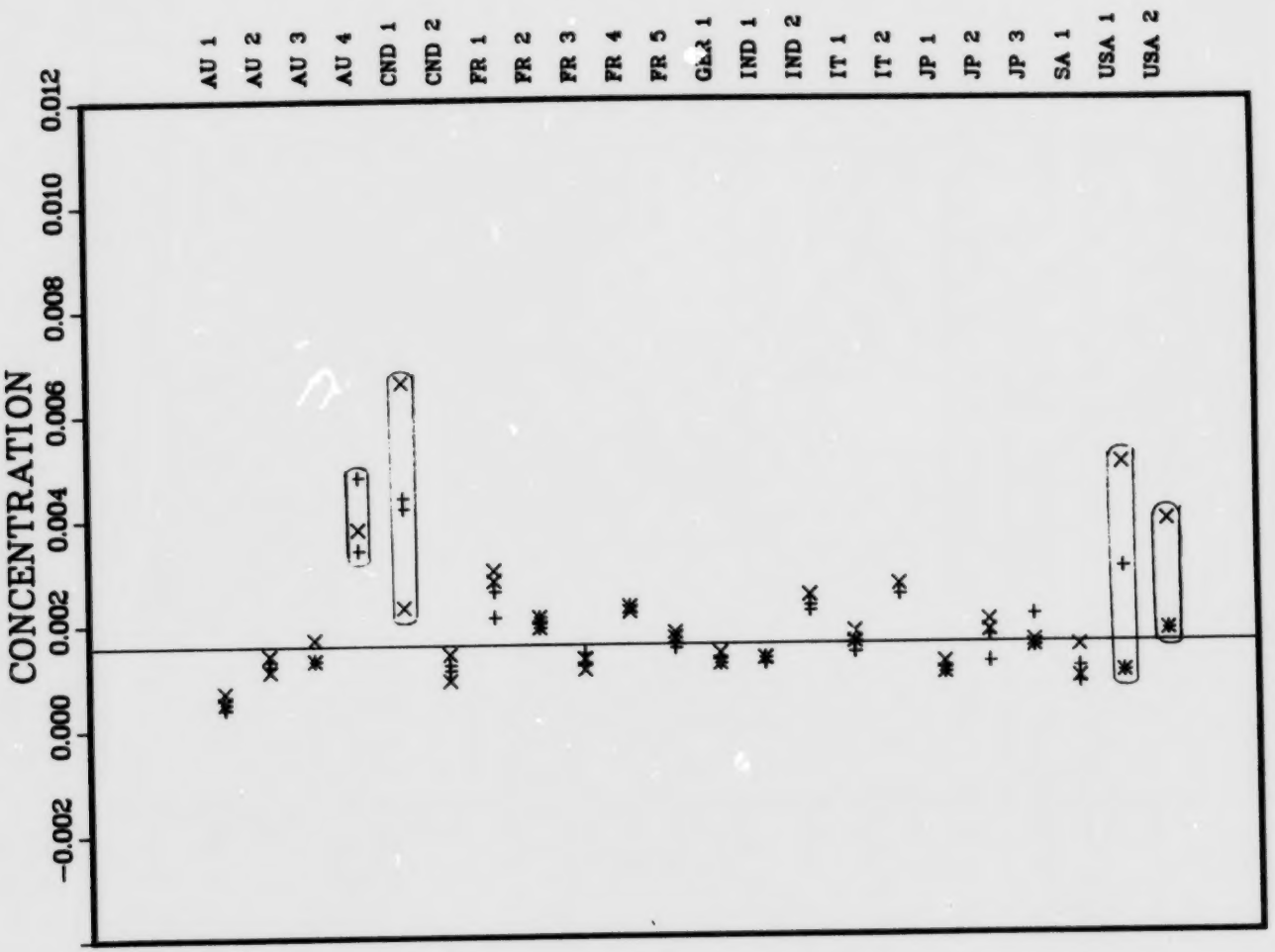
Figure 2.4



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – LEAD

SAMPLE: 80–1 (EURO–STANDARD 680–1)

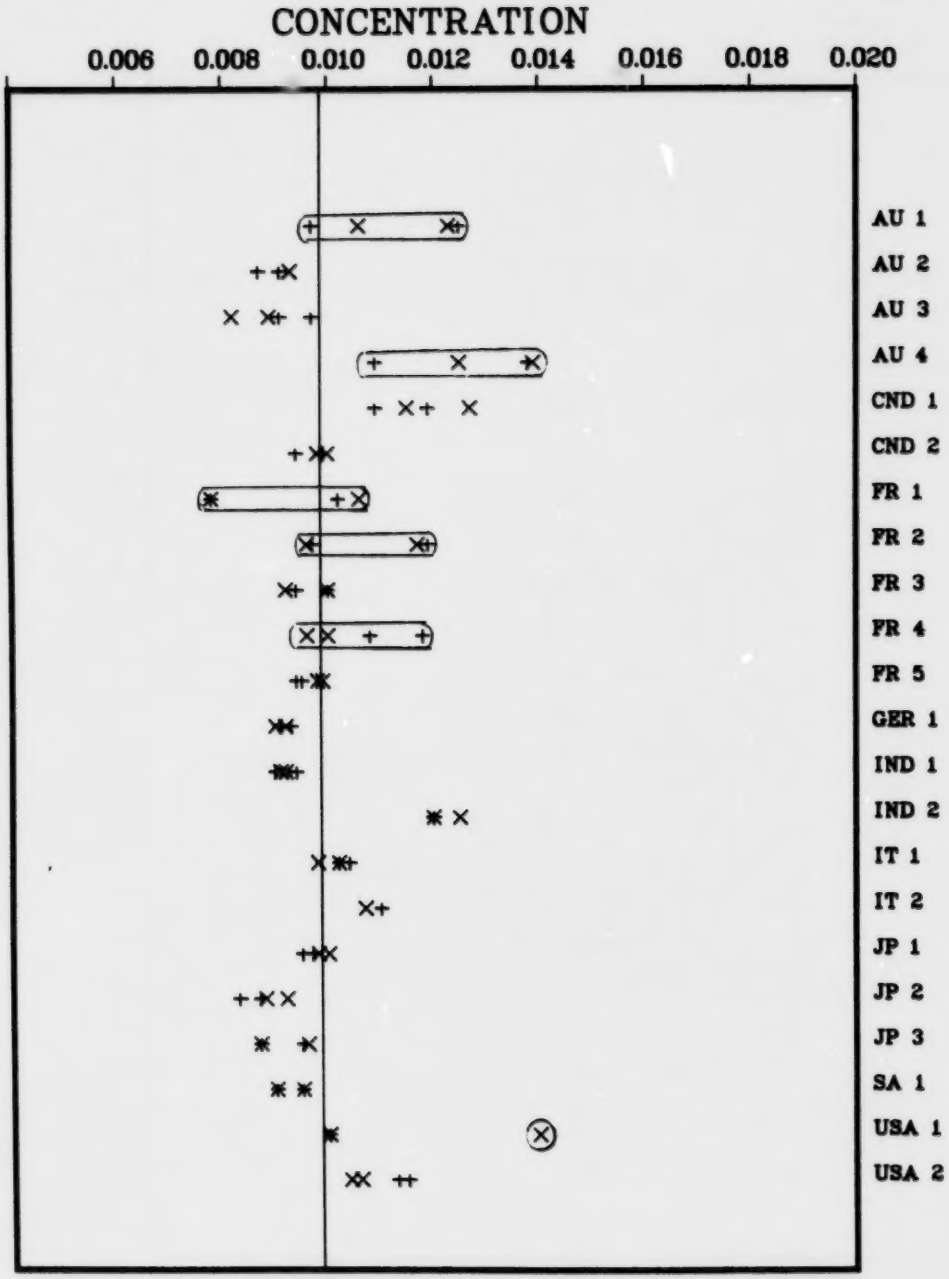
Figure 2.5



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – ZINC

SAMPLE: 76–16 (SISHEN IRON ORE)

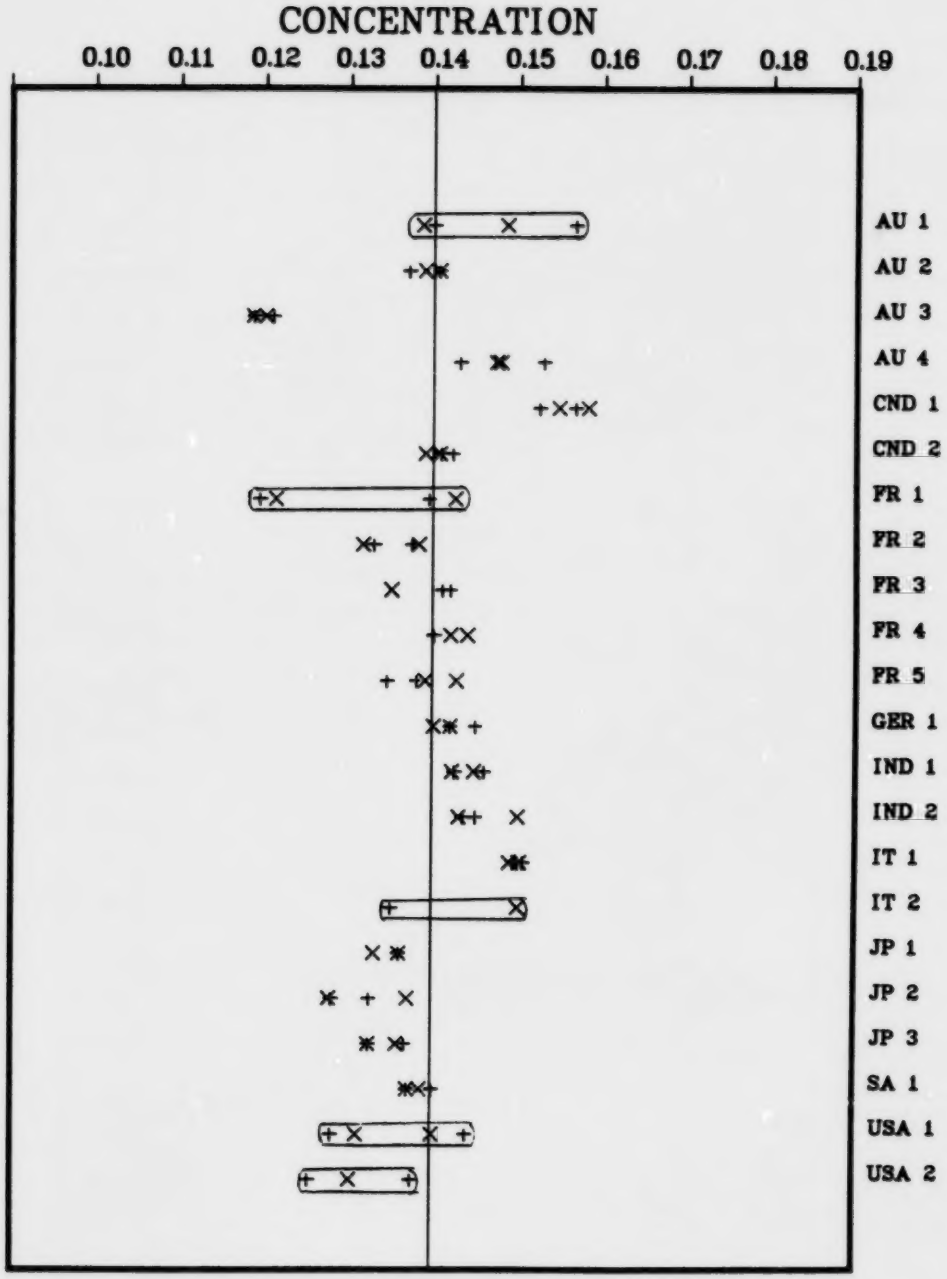
Figure 2.6



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – ZINC

SAMPLE 76-21 (ROBB RIVER)

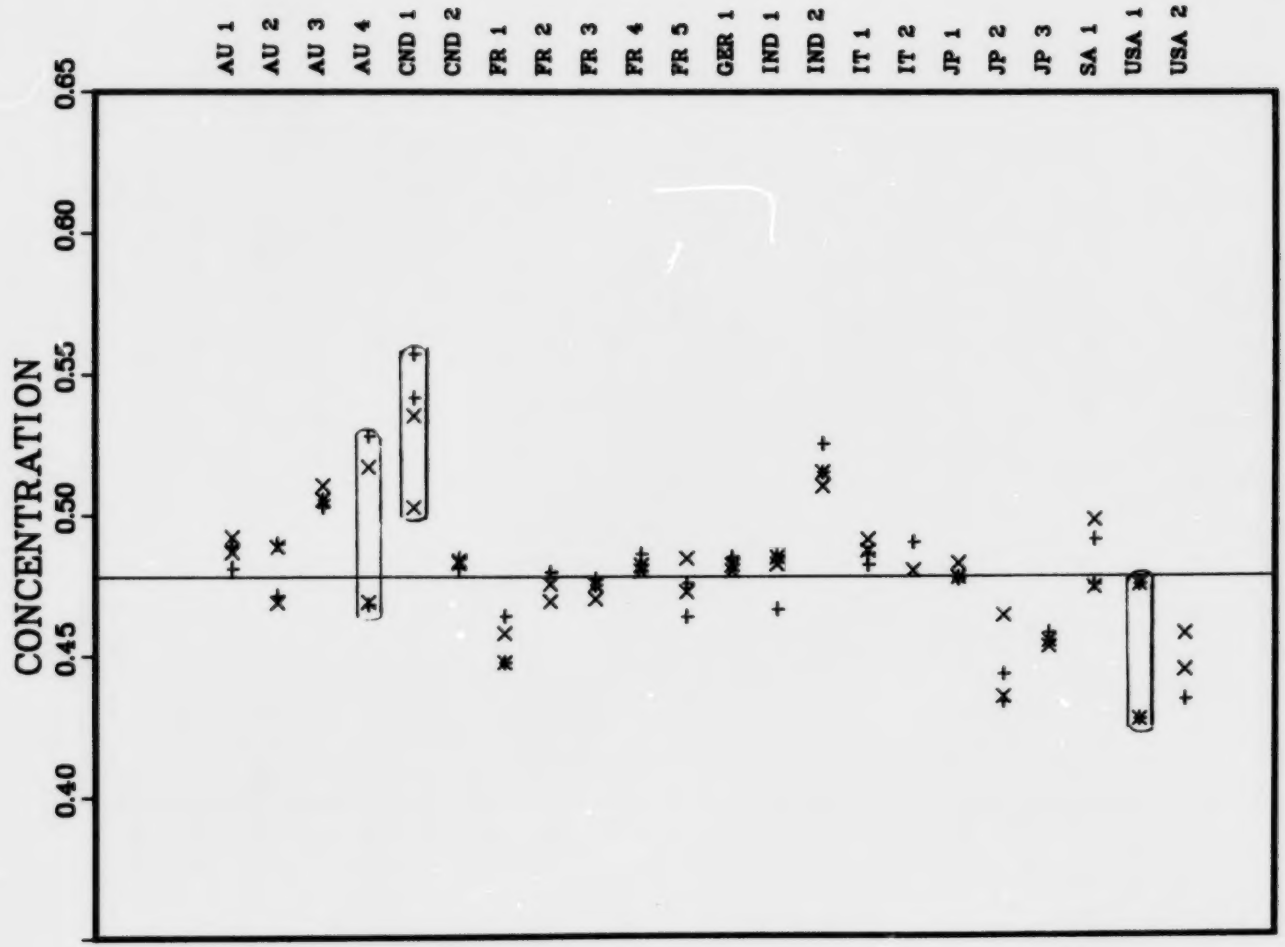
Figure 2.7



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – ZINC

SAMPLE 79-1 (STOLLBERG)

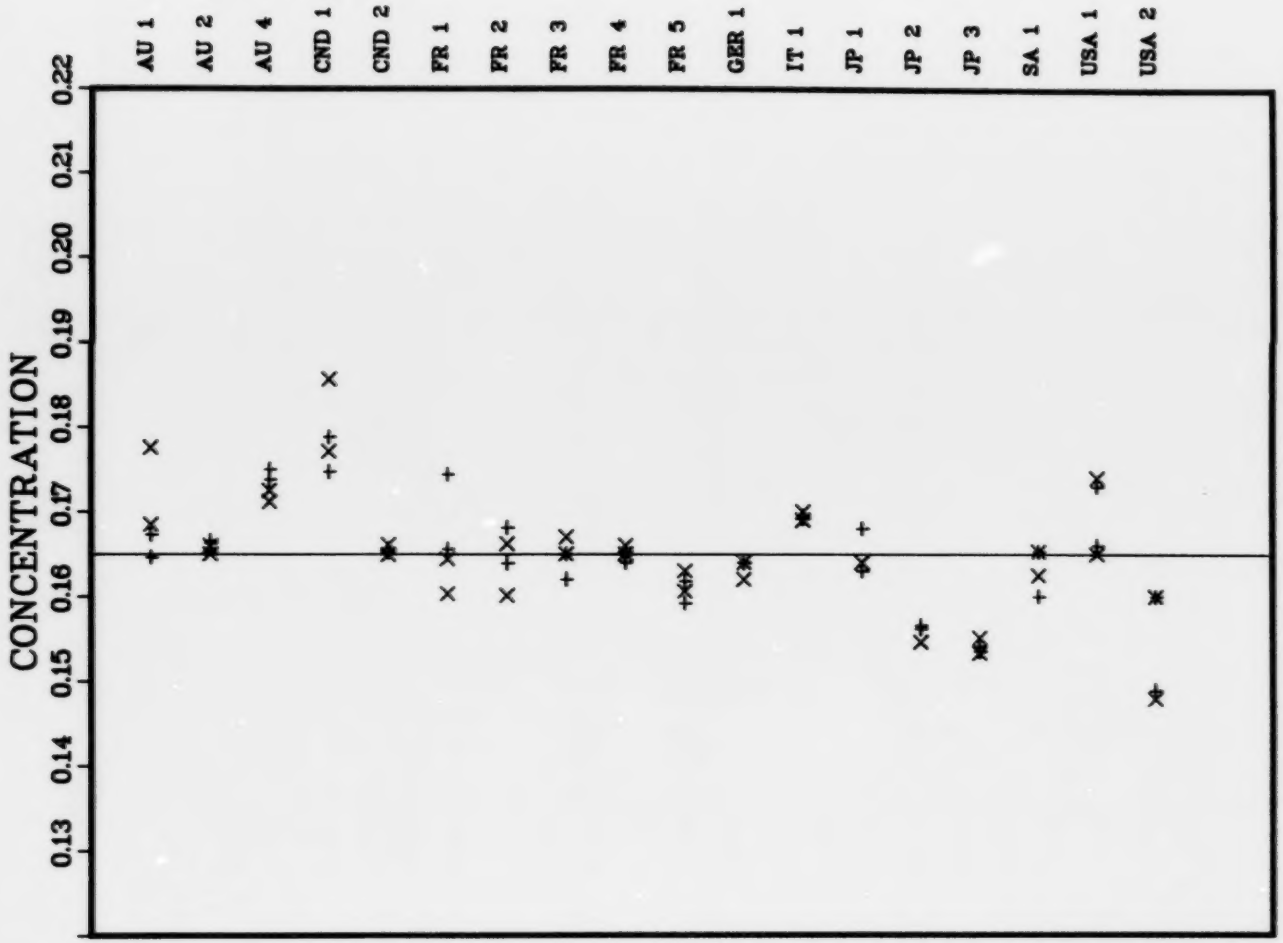
Figure 2.8



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – ZINC

SAMPLE: 79–13 (WHYALLA ORE)

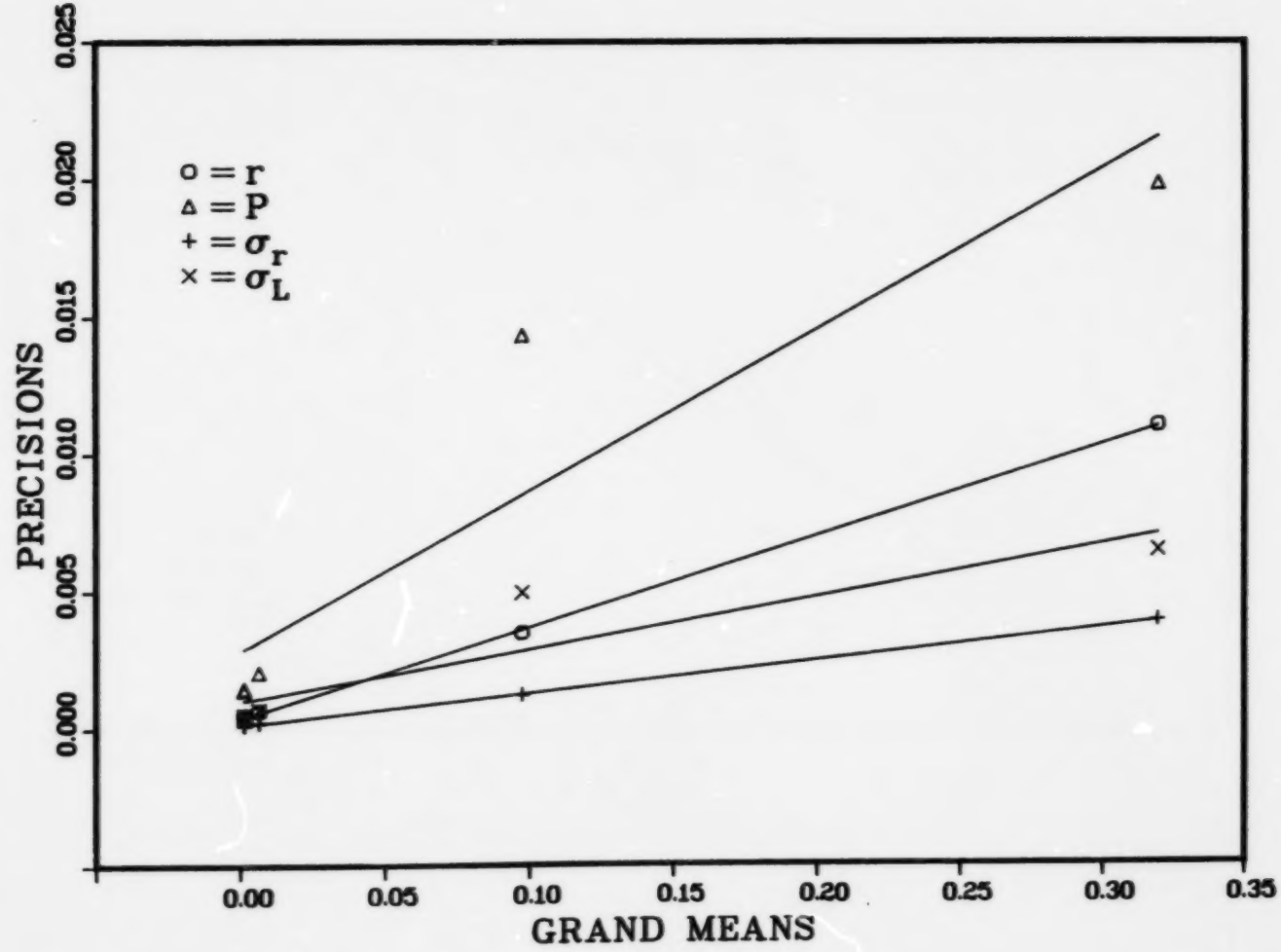
Figure 2.9



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – ZINC

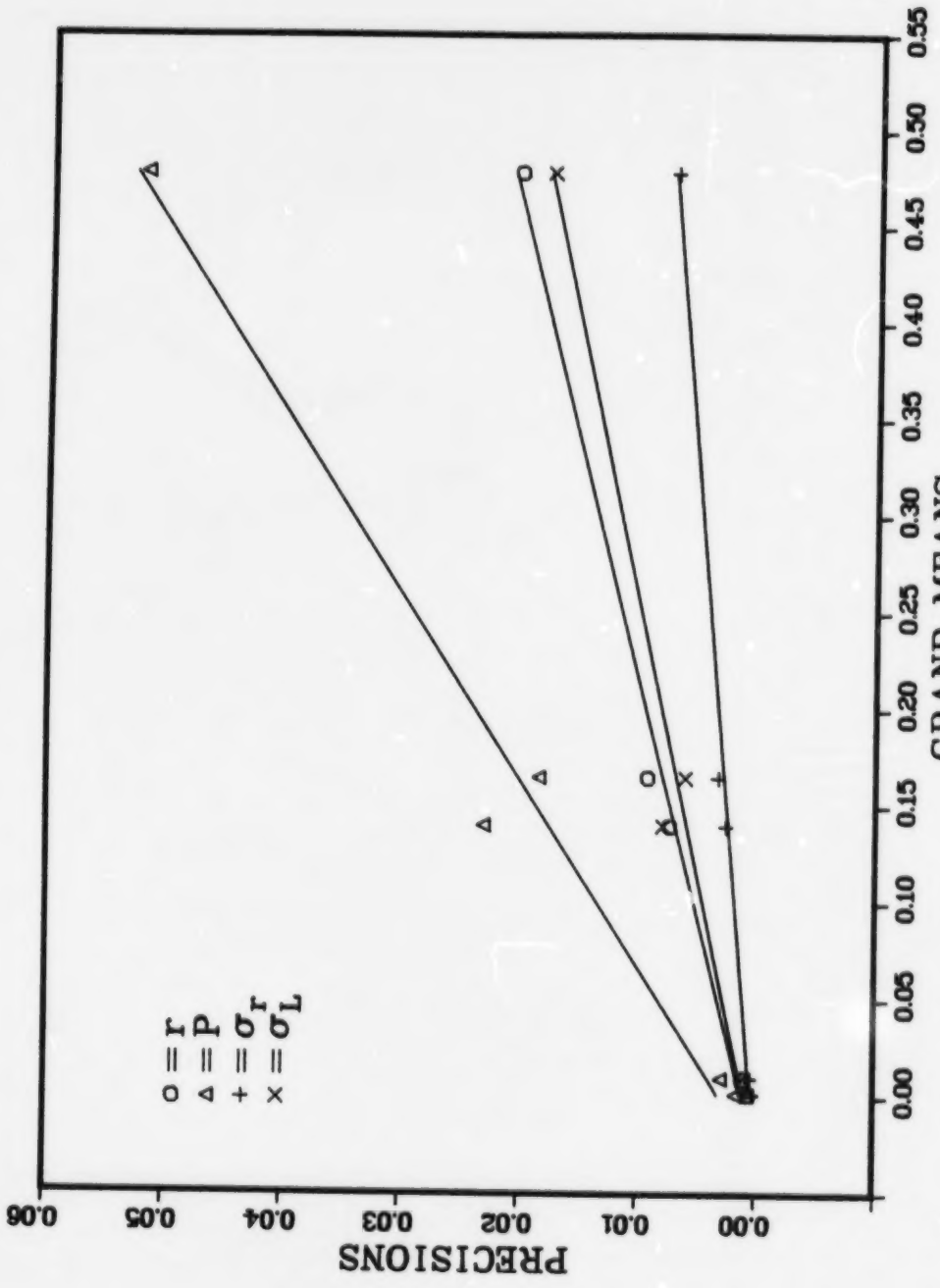
SAMPLE: 80–1 (EURO–STANDARD 680–1)

Figure 2.10



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – LEAD

Figure 3.1



ISO/TC 102/SC 2/WG 14B – PB/ZN AAS METHOD – ZINC
Figure 3.2

APPENDIX A

APPENDIX A

ABBREVIATIONS USED IN THIS REPORT

σ_r = SIGMA-R - within-laboratory standard deviation

σ_L = SIGMA-L - between-laboratories standard deviation

r* = R - repeatability
= $2.83\ \sigma_r$

P** = permissible tolerance between-laboratories
= $2.83\sqrt{\sigma_L^2 + \sigma_r^2/2}$

COUNTRY ABBREVIATIONS

AU = Australia
CND = Canada
FR = France
GER = Germany
IND = India
IT = Italy
JP = Japan
SA = South Africa
USA = United States

K_o = Number of participating laboratories
K = Number of laboratories data sets used for ANOVA
= $K_o - K_r$
K_r = Number of outlying laboratories
No = Original number of analytical results
N = Number of analytical results used for ANOVA

* Repeatability, r, is the value below which the absolute difference between two independent single test (analysis) results produced by a laboratory on identical material using the same equipment within a short interval of time, using the standardized test method, may be expected to be with a 95% probability.

** Permissible tolerance between laboratories, P, is the value below which the absolute difference between two means of duplicate test results on identical material obtained by operators of different laboratories using the standardized test method, may be expected to lie with a 95% probability.

APPENDIX B

DETAILED COMPUTATION OF THE ANALYTICAL DATA

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-16 (SISHEN IRON ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0015	.0013	.00135	.1667E-07
		2	.0014	.0012		
2	AU 2	1	.0022	.0021	.00200	.3333E-07
		2	.0019	.0018		
3	AU 3	1	.0014	.0013	.00135	.3333E-08
		2	.0014	.0013		
4	AU 4	1	.0009	.0010	.00090	.2000E-07
		2	.0007	.0010		
5	CND 1	1	.0031	.0037	.00370	.2847E-05
		2	.0020	.0060		
6	CND 2	1	.0018	.0018	.00183	.2500E-08
		2	.0018	.0019		
7	FR 1	1	.0019	.0014	.00168	.6917E-07
		2	.0019	.0015		
8	FR 2	1	.0027	.0037	.00280	.6200E-06
		2	.0030	.0018		
9	FR 3	1	.0015	.0016	.00160	.6667E-08
		2	.0016	.0017		
10	FR 4	1	.0015	.0015	.00145	.3333E-08
		2	.0014	.0014		
11	FR 5	1	.0008	.0011	.00090	.3333E-07
		2	.0007	.0010		
12	GER 1	1	.0013	.0015	.00138	.9167E-08
		2	.0013	.0014		
13	IND 1	1	.0010	.0013	.00113	.1583E-07
		2	.0011	.0011		
14	IND 2	1	.0028	.0030	.00293	.4917E-07
		2	.0027	.0032		
15	IT 1	1	.0018	.0018	.00185	.3333E-08
		2	.0019	.0019		
16	IT 2	1	.0025		.00200	.5000E-06
		2	.0015			
17	JP 1	1	.0019	.0020	.00198	.2500E-08
		2	.0020	.0020		
18	JP 2	1	.0014	.0011	.00123	.4250E-07
		2	.0014	.0010		
19	JP 3	1	.0011	.0012	.00115	.3333E-08
		2	.0011	.0012		
20	SA 1	1	.0016	.0014	.00153	.9167E-08
		2	.0016	.0015		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-16 (SISHEN IRON ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.0020	.0010	.00150	.3333E-06
		2	.0020	.0010		
22	USA 2	1	.0020	.0012	.00170	.1900E-06
		2	.0019			

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-16 (SISHEN IRON ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	53.400
CHI-SQUARE(.95,29)	42.565

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE

LAB- 5 BOTTLE- 2 C-CALC = .718 C-CRIT(2,30) = .293

DOORNBOS' TEST FOR BOTTLE MEANS

LAB- 5 BOTTLE- 2 T-CALC = 3.781 T-CRIT(.00125,38) = 3.487

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 5	DOORNBOS' TEST FOR BOTTLE MEANS
LAB- 6	ZERO WITHIN-BOTTLE VARIANCE
LAB-10	ZERO WITHIN-BOTTLE VARIANCE
LAB-13	ZERO WITHIN-BOTTLE VARIANCE
LAB-15	ZERO WITHIN-BOTTLE VARIANCE
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-17	ZERO WITHIN-BOTTLE VARIANCE
LAB-22	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-16 (SISHEN IRON ORE)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	13	.19498036E-04	.14998489E-05
BETWEEN BOTTLES	14	.78250000E-06	.55892857E-07
WITHIN BOTTLES	28	.29650000E-05	.10589286E-06
TOTAL	55	.23245536E-04	

F-CALC = .528 F-CRIT(.95;14,28) = 2.064

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-16 (SISHEN IRON ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	122.500
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB- 5	C-CALC =	.591	C-CRIT(4,22) =	.204
LAB- 8	C-CALC =	.315	C-CRIT(4,21) =	.212
LAB-16	C-CALC =	.371	C-CRIT(4,20) =	.220
LAB-21	C-CALC =	.394	C-CRIT(4,19) =	.229
LAB-22	C-CALC =	.370	C-CRIT(4,18) =	.239

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 5	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 8	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-16	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-21	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-22	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-16 (SISHEN IRON ORE)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.15474706E-04	.96716912E-06
WITHIN LABS	51	.97000000E-06	.19019608E-07
TOTAL	67	.16444706E-04	

REPEATABILITY VARIANCE	.19019608E-07
REPEATABILITY STD. DEV.	.00013791
BETWEEN-LABORATORIES VARIANCE	.23703738E-06
BETWEEN-LABORATORIES STD. DEV.	.00048686
REPEATABILITY	.00039029
PERMISSIBLE TOLERANCE BETWEEN LABS	.00140519
GRAND MEAN	.00154118
VARIANCE OF THE GRAND MEAN	.14223075E-07

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-21 (ROBE RIVER)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0012	.0008	.00108	.1158E-06
		2	.0015	.0008		
2	AU 2	1	.0019	.0017	.00183	.2250E-07
		2	.0020	.0017		
3	AU 3	1	.0011	.0013	.00120	.6667E-08
		2	.0012	.0012		
4	AU 4	1	.0011	.0010	.00108	.9167E-08
		2	.0012	.0010		
5	CND 1	1	.0023	.0015	.00180	.1467E-06
		2	.0015	.0019		
6	CND 2	1	.0018	.0018	.00183	.2500E-08
		2	.0019	.0018		
7	FR 1	1	.0015	.0011	.00135	.3667E-07
		2	.0015	.0013		
8	FR 2	1	.0040	.0018	.00290	.1613E-05
		2	.0040	.0018		
9	FR 3	1	.0013	.0015	.00140	.1333E-07
		2	.0013	.0015		
10	FR 4	1	.0016	.0016	.00140	.5333E-07
		2	.0012	.0012		
11	FR 5	1	.0005	.0004	.00045	.3333E-08
		2	.0005	.0004		
12	GER 1	1	.0012	.0010	.00113	.2250E-07
		2	.0013	.0010		
13	IND 1	1	.0011	.0013	.00113	.2917E-07
		2	.0009	.0012		
14	IND 2	1	.0026	.0028	.00273	.4917E-07
		2	.0030	.0025		
15	IT 1	1	.0019	.0020	.00190	.6667E-08
		2	.0018	.0019		
16	IT 2	1	.0025		.00225	.1250E-06
		2	.0020			
17	JP 1	1	.0016	.0017	.00165	.3333E-08
		2	.0017	.0016		
18	JP 2	1	.0012	.0009	.00105	.1667E-07
		2	.0010	.0011		
19	JP 3	1	.0008	.0009	.00085	.3333E-08
		2	.0008	.0009		
20	SA 1	1	.0016	.0014	.00150	.1333E-07
		2	.0016	.0014		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-21 (ROBE RIVER)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.0020	.0010	.00150	.3333E-06
		2	.0020	.0010		
22	USA 2	1	.0012	.0020	.00160	.2133E-06
		2	.0012	.0020		

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-21 (ROBE RIVER)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	47.471
CHI-SQUARE(.95,35)	49.811

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 3	ZERO WITHIN-BOTTLE VARIANCE
LAB- 6	ZERO WITHIN-BOTTLE VARIANCE
LAB-10	ZERO WITHIN-BOTTLE VARIANCE
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-21 (ROBE RIVER)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	17	.25002778E-04	.14707516E-05
BETWEEN BOTTLES	18	.11500000E-06	.63888889E-08
WITHIN BOTTLES	36	.78400000E-05	.21777778E-06
TOTAL	71	.32957778E-04	

F-CALC = .029 F-CRIT(.95;18,36) = 1.899

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-21 (ROBE RIVER)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	91.039
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB- 8	C-CALC =	.568	C-CRIT(4,22) =	.204
LAB-21	C-CALC =	.272	C-CRIT(4,21) =	.212
LAB-22	C-CALC =	.239	C-CRIT(4,20) =	.220

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 8	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-21	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-22	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 76-21 (ROBE RIVER)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	18	.18707095E-04	.10392830E-05
WITHIN LABS	55	.17875000E-05	.32500000E-07
TOTAL	73	.20494595E-04	

REPEATABILITY VARIANCE	.32500000E-07
REPEATABILITY STD. DEV.	.00018028
BETWEEN-LABORATORIES VARIANCE	.25868731E-06
BETWEEN-LABORATORIES STD. DEV.	.00050861
REPEATABILITY	.00051019
PERMISSIBLE TOLERANCE BETWEEN LABS	.00148390
GRAND MEAN	.00142973
VARIANCE OF THE GRAND MEAN	.14233326E-07

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-1 (STOLLBERG)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0954	.0958	.09495	.6167E-06
		2	.0941	.0945		
2	AU 2	1	.0978	.0981	.09805	.7000E-07
		2	.0979	.0984		
3	AU 3	1	.0892	.0897	.09010	.6467E-06
		2	.0905	.0910		
4	AU 4	1	.0969	.0979	.09723	.2225E-06
		2	.0969	.0972		
5	CND 1	1	.0950	.1036	.09908	.1548E-04
		2	.0967	.1010		
6	CND 2	1	.0994	.1000	.09928	.9025E-06
		2	.0979	.0998		
7	FR 1	1	.0953	.0962	.09575	.2700E-06
		2	.0953	.0962		
8	FR 2	1	.1039	.1190	.11215	.8970E-04
		2	.1041	.1216		
9	FR 3	1	.0940	.0950	.09400	.6667E-06
		2	.0930	.0940		
10	FR 4	1	.0950	.0950	.09550	.3333E-06
		2	.0960	.0960		
11	FR 5	1	.0979	.0945	.09705	.4597E-05
		2	.0963	.0995		
12	GER 1	1	.0960	.0940	.09550	.1667E-05
		2	.0970	.0950		
13	IND 1	1	.1029	.0980	.09970	.1055E-04
		2	.1019	.0960		
14	IND 2	1	.1175	.1155	.12075	.2475E-04
		2	.1250	.1250		
15	IT 1	1	.1080	.1090	.10950	.1667E-05
		2	.1110	.1100		
16	IT 2	1	.0950		.09750	.1250E-04
		2	.1000			
17	JP 1	1	.1050	.1100	.10813	.5729E-05
		2	.1100	.1075		
18	JP 2	1	.0958	.1058	.10010	.2332E-04
		2	.0964	.1024		
19	JP 3	1	.0948	.0933	.09380	.5400E-06
		2	.0939	.0932		
20	SA 1	1	.0925	.0950	.09425	.4750E-05
		2	.0925	.0970		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-1 (STOLLBERG)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.1000	.0980	.09925	.9167E-06
		2	.1000	.0990		
22	USA 2	1	.0977		.09780	.7300E-06
		2	.0970	.0987		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-1 (STOLLBERG)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	57.794
CHI-SQUARE(.95,35)	49.811

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE

LAB- 8 BOTTLE- 2 C-CALC = .330 C-CRIT(2,36) = .256

LAB- 8 BOTTLE- 1 C-CALC = .366 C-CRIT(2,35) = .262

DOORNBOS' TEST FOR BOTTLE MEANS

LAB-14 BOTTLE- 2 T-CALC = 4.104 T-CRIT(.00125,38) = 3.487

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 8	COCHRAN'S TEST FOR BOTTLE VARIANCE
LAB-10	ZERO WITHIN-BOTTLE VARIANCE
LAB-14	DOORNBOS' TEST FOR BOTTLE MEANS
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-22	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-1 (STOLLBERG)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.15145488E-02	.94659301E-04
BETWEEN BOTTLES	17	.20630000E-04	.12135294E-05
WITHIN BOTTLES	34	.19720000E-03	.58000000E-05
TOTAL	67	.17323788E-02	

F-CALC = .209 F-CRIT(.95;17,34) = 1.933

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-1 (STOLLBERG)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	86.981
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB- 8	C-CALC =	.447	C-CRIT(4,22) =	.204
LAB-14	C-CALC =	.223	C-CRIT(4,21) =	.212
LAB-18	C-CALC =	.271	C-CRIT(4,20) =	.220
LAB- 5	C-CALC =	.246	C-CRIT(4,19) =	.229
LAB-16	C-CALC =	.264	C-CRIT(4,18) =	.239
LAB-13	C-CALC =	.303	C-CRIT(4,17) =	.250

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 5	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 8	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-13	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-14	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-16	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-18	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-1 (STOLLBERG)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	15	.14903169E-02	.99354458E-04
WITHIN LABS	47	.72242500E-04	.15370745E-05
TOTAL	62	.15625594E-02	

REPEATABILITY VARIANCE	.15370745E-05
REPEATABILITY STD. DEV.	.00123979
BETWEEN-LABORATORIES VARIANCE	.24848771E-04
BETWEEN-LABORATORIES STD. DEV.	.00498485
REPEATABILITY	.00350860
PERMISSIBLE TOLERANCE BETWEEN LABS	.01432363
GRAND MEAN	.09750317
VARIANCE OF THE GRAND MEAN	.15833156E-05

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-13 (WHYALLA ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0060	.0064	.00623	.2917E-07
		2	.0062	.0063		
2	AU 2	1	.0076	.0075	.00748	.1583E-07
		2	.0075	.0073		
3	AU 3	1	.0059	.0054	.00575	.5667E-07
		2	.0059	.0058		
4	AU 4	1	.0061	.0065	.00625	.9000E-07
		2	.0059	.0065		
5	CND 1	1	.0071	.0069	.00693	.1583E-07
		2	.0068	.0069		
6	CND 2	1	.0069	.0068	.00698	.2917E-07
		2	.0072	.0070		
7	FR 1	1	.0059	.0065	.00625	.1233E-06
		2	.0060	.0066		
8	FR 2	1	.0109	.0089	.00955	.2990E-05
		2	.0110	.0074		
9	FR 3	1	.0065	.0065	.00638	.6250E-07
		2	.0065	.0060		
10	FR 4	1	.0065	.0065	.00648	.4250E-07
		2	.0062	.0067		
11	FR 5	1	.0062	.0065	.00620	.6000E-07
		2	.0062	.0059		
12	GER 1	1	.0059	.0061	.00625	.9667E-07
		2	.0066	.0064		
13	IND 1	1	.0057	.0058	.00578	.2500E-08
		2	.0058	.0058		
14	IND 2	1	.0068	.0065	.00663	.1225E-06
		2	.0062	.0070		
15	IT 1	1	.0075	.0072	.00733	.7583E-07
		2	.0070	.0076		
16	IT 2	1	.0092		.00895	.1250E-06
		2	.0087			
17	JP 1	1	.0084	.0076	.00805	.1167E-06
		2	.0080	.0082		
18	JP 2	1	.0062	.0064	.00648	.6250E-07
		2	.0068	.0065		
19	JP 3	1	.0056	.0060	.00588	.4917E-07
		2	.0058	.0061		
20	SA 1	1	.0063	.0063	.00630	0.
		2	.0063	.0063		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-13 (WHYALLA ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.0060	.0060	.00600	0.
		2	.0060	.0060		
22	USA 2	1	.0084	.0073	.00807	.4433E-06
		2	.0085			

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-13 (WHYALLA ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	42.856
CHI-SQUARE(.95,29)	42.565

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE

LAB- 8	BOTTLE- 2	C-CALC = .609	C-CRIT(2,30) = .293
LAB- 8	BOTTLE- 1	C-CALC = .481	C-CRIT(2,29) = .300

DOORNBOS' TEST FOR BOTTLE MEANS

LAB- 8	BOTTLE- 1	T-CALC = 4.457	T-CRIT(.00125,38) = 3.487
LAB- 8	BOTTLE- 2	T-CALC = 4.397	T-CRIT(.00128,37) = 3.486

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 8	DOORNBOS' TEST FOR BOTTLE MEANS
LAB- 9	ZERO WITHIN-BOTTLE VARIANCE
LAB-10	ZERO WITHIN-BOTTLE VARIANCE
LAB-13	ZERO WITHIN-BOTTLE VARIANCE
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-20	ZERO WITHIN-BOTTLE VARIANCE
LAB-21	ZERO WITHIN-BOTTLE VARIANCE
LAB-22	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-13 (WHYALLA ORE)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	13	.22272143E-04	.17132418E-05
BETWEEN BOTTLES	14	.67000000E-06	.47857143E-07
WITHIN BOTTLES	28	.21600000E-05	.77142857E-07
TOTAL	55	.25102143E-04	

F-CALC = .620 F-CRIT(.95;14,28) = 2.064

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-13 (WHYALLA ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	65.417
CHI-SQUARE(.95,19)	30.148

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB- 8	C-CALC =	.649	C-CRIT(4,20) =	.220
LAB-22	C-CALC =	.274	C-CRIT(4,19) =	.229

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 8	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-22	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 79-13 (WHYALLA ORE)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	19	.38035833E-04	.20018860E-05
WITHIN LABS	58	.32775000E-05	.56508621E-07
TOTAL	77	.41313333E-04	

REPEATABILITY VARIANCE	.56508621E-07
REPEATABILITY STD. DEV.	.00023772
BETWEEN-LABORATORIES VARIANCE	.49914287E-06
BETWEEN-LABORATORIES STD. DEV.	.00070650
REPEATABILITY	.00067273
PERMISSIBLE TOLERANCE BETWEEN LABS	.00205521
GRAND MEAN	.00656667
VARIANCE OF THE GRAND MEAN	.25993372E-07

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 80-1 (EURO-STANDARD 680-1)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.3100	.3166	.31440	.1000E-04
		2	.3142	.3168		
2	AU 2	1	.3305	.3168	.32265	.3803E-04
		2	.3245	.3188		
3	AU 4	1	.3100	.3170	.31613	.2073E-04
		2	.3165	.3210		
4	CND 1	1	.3237	.3267	.32233	.2190E-04
		2	.3157	.3232		
5	CND 2	1	.3174	.3167	.31738	.2492E-06
		2	.3179	.3175		
6	FR 1	1	.3340	.3325	.33200	.9500E-05
		2	.3340	.3275		
7	FR 2	1	.3369	.3279	.33083	.1689E-04
		2	.3289	.3296		
8	FR 3	1	.3100	.3150	.31225	.2092E-04
		2	.3070	.3170		
9	FR 4	1	.3190	.3200	.31850	.1667E-05
		2	.3170	.3180		
10	FR 5	1	.3215	.3280	.32150	.2817E-04
		2	.3215	.3150		
11	GER 1	1	.3200	.3210	.32000	.6667E-06
		2	.3190	.3200		
12	IT 1	1	.3190	.3195	.31963	.3958E-06
		2	.3195	.3205		
13	JP 1	1	.3100	.3150	.31125	.6250E-05
		2	.3100	.3100		
14	JP 2	1	.3127	.3362	.32543	.1830E-03
		2	.3148	.3380		
15	JP 3	1	.3106	.3024	.30745	.5724E-04
		2	.3166	.3002		
16	SA 1	1	.3190	.3200	.31888	.1062E-05
		2	.3190	.3175		
17	USA 1	1	.3250	.3290	.32750	.9000E-05
		2	.3250	.3310		
18	USA 2	1	.3294	.3349	.33415	.9475E-04
		2	.3474	.3249		

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - LEAD
SAMPLE: 80-1 (EURO-STANDARD 680-1)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	47.049
CHI-SQUARE(.95,33)	47.407

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB-13 ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 80-1 (EURO-STANDARD 680-1)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.32414797E-02	.20259248E-03
BETWEEN BOTTLES	17	.16009750E-03	.94175000E-05
WITHIN BOTTLES	34	.13824150E-02	.40659265E-04
TOTAL	67	.47839922E-02	

F-CALC = .232 F-CRIT(.95;17,34) = 1.933

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 80-1 (EURO-STANDARD 680-1)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	57.337
CHI-SQUARE(.95,17)	27.593

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB-14	C-CALC =	.352	C-CRIT(4,18) =	.239
LAB-18	C-CALC =	.281	C-CRIT(4,17) =	.250

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB-14	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-18	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - LEAD
SAMPLE: 80-1 (EURO-STANDARD 680-1)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	15	.27191294E-02	.18127529E-03
WITHIN LABS	48	.72796500E-03	.15165937E-04
TOTAL	63	.34470944E-02	

REPEATABILITY VARIANCE	.15165937E-04
REPEATABILITY STD. DEV.	.00389435
BETWEEN-LABORATORIES VARIANCE	.41527339E-04
BETWEEN-LABORATORIES STD. DEV.	.00644417
REPEATABILITY	.01102100
PERMISSIBLE TOLERANCE BETWEEN LABS	.01983229
GRAND MEAN	.31954063
VARIANCE OF THE GRAND MEAN	.28324264E-05

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-16 (SISHEN IRON ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0005	.0007	.00053	.1583E-07
		2	.0005	.0004		
2	AU 2	1	.0011	.0014	.00125	.1667E-07
		2	.0013	.0012		
3	AU 3	1	.0013	.0017	.00140	.4000E-07
		2	.0013	.0013		
4	AU 4	1	.0038	.0038	.00395	.3567E-06
		2	.0048	.0034		
5	CND 1	1	.0066	.0023	.00438	.3096E-05
		2	.0044	.0042		
6	CND 2	1	.0009	.0014	.00115	.4333E-07
		2	.0012	.0011		
7	FR 1	1	.0030	.0028	.00263	.1492E-06
		2	.0026	.0021		
8	FR 2	1	.0021	.0019	.00200	.1333E-07
		2	.0021	.0019		
9	FR 3	1	.0011	.0013	.00125	.1667E-07
		2	.0012	.0014		
10	FR 4	1	.0022	.0023	.00228	.2500E-08
		2	.0023	.0023		
11	FR 5	1	.0018	.0017	.00165	.1667E-07
		2	.0016	.0015		
12	GER 1	1	.0012	.0014	.00128	.9167E-08
		2	.0012	.0013		
13	IND 1	1	.0013	.0013	.00128	.2500E-08
		2	.0013	.0012		
14	IND 2	1	.0025	.0025	.00238	.2250E-07
		2	.0022	.0023		
15	IT 1	1	.0018	.0016	.00160	.2667E-07
		2	.0016	.0014		
16	IT 2	1	.0027		.00260	.2000E-07
		2	.0025			
17	JP 1	1	.0012	.0010	.00108	.9167E-08
		2	.0010	.0011		
18	JP 2	1	.0018	.0020	.00168	.1158E-06
		2	.0017	.0012		
19	JP 3	1	.0015	.0016	.00168	.8250E-07
		2	.0015	.0021		
20	SA 1	1	.0015	.0009	.00108	.9583E-07
		2	.0011	.0008		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-16 (SISHEN IRON ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.0050	.0010	.00250	.3667E-05
		2	.0030	.0010		
22	USA 2	1	.0018	.0039	.00250	.1470E-05
		2	.0018			

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-16 (SISHEN IRON ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	65.872
CHI-SQUARE(.95,29)	42.565

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE

LAB- 5	BOTTLE- 1	C-CALC =	.454	C-CRIT(2,30) =	.293
LAB-21	BOTTLE- 1	C-CALC =	.720	C-CRIT(2,29) =	.300
LAB-21	BOTTLE- 2	C-CALC =	.644	C-CRIT(2,28) =	.308

DOORNBOS' TEST FOR BOTTLE MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 3	ZERO WITHIN-BOTTLE VARIANCE
LAB- 4	ZERO WITHIN-BOTTLE VARIANCE
LAB- 5	COCHRAN'S TEST FOR BOTTLE VARIANCE
LAB-10	ZERO WITHIN-BOTTLE VARIANCE
LAB-13	ZERO WITHIN-BOTTLE VARIANCE
LAB-14	ZERO WITHIN-BOTTLE VARIANCE
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-21	COCHRAN'S TEST FOR BOTTLE VARIANCE
LAB-22	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-16 (SISHEN IRON ORE)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	12	.12737308E-04	.10614423E-05
BETWEEN BOTTLES	13	.74750000E-06	.57500000E-07
WITHIN BOTTLES	26	.10850000E-05	.41730769E-07
TOTAL	51	.14569808E-04	

F-CALC = 1.378 F-CRIT(.95;13,26) = 2.119

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-16 (SISHEN IRON ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	122.547
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB-21	C-CALC =	.395	C-CRIT(4,22) =	.204
LAB- 5	C-CALC =	.551	C-CRIT(4,21) =	.212
LAB-22	C-CALC =	.582	C-CRIT(4,20) =	.220
LAB- 4	C-CALC =	.338	C-CRIT(4,19) =	.229

DIXON'S TEST FOR LABORATORY MEANS

LAB- 5	R =	.530	D-CRIT(22) =	.468

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 4	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 5	DIXON'S TEST FOR LABORATORY MEANS
LAB-21	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-22	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-16 (SISHEN IRON ORE)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	17	.20675857E-04	.12162269E-05
WITHIN LABS	52	.20550000E-05	.39519231E-07
TOTAL	69	.22730857E-04	

REPEATABILITY VARIANCE	.39519231E-07
REPEATABILITY STD. DEV.	.00019879
BETWEEN-LABORATORIES VARIANCE	.30282918E-06
BETWEEN-LABORATORIES STD. DEV.	.00055030
REPEATABILITY	.00056259
PERMISSIBLE TOLERANCE BETWEEN LABS	.00160735
GRAND MEAN	.00156857
VARIANCE OF THE GRAND MEAN	.17621877E-07

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-21 (ROBE RIVER)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0123	.0106	.01128	.1829E-05
		2	.0125	.0097		
2	AU 2	1	.0093	.0093	.00910	.8000E-07
		2	.0091	.0087		
3	AU 3	1	.0089	.0082	.00898	.3825E-06
		2	.0097	.0091		
4	AU 4	1	.0125	.0139	.01278	.1969E-05
		2	.0109	.0138		
5	CND 1	1	.0127	.0115	.01175	.5700E-06
		2	.0119	.0109		
6	CND 2	1	.0098	.0100	.00978	.6917E-07
		2	.0094	.0099		
7	FR 1	1	.0106	.0078	.00910	.2280E-05
		2	.0102	.0078		
8	FR 2	1	.0096	.0117	.01073	.1549E-05
		2	.0097	.0119		
9	FR 3	1	.0092	.0100	.00965	.1700E-06
		2	.0094	.0100		
10	FR 4	1	.0100	.0096	.01055	.9433E-06
		2	.0108	.0118		
11	FR 5	1	.0099	.0098	.00965	.5667E-07
		2	.0094	.0095		
12	GER 1	1	.0090	.0092	.00915	.1667E-07
		2	.0091	.0093		
13	IND 1	1	.0091	.0092	.00918	.2917E-07
		2	.0090	.0094		
14	IND 2	1	.0120	.0125	.01213	.6250E-07
		2	.0120	.0120		
15	IT 1	1	.0098	.0102	.01015	.6333E-07
		2	.0102	.0104		
16	IT 2	1	.0107		.01085	.4500E-07
		2	.0110			
17	JP 1	1	.0100	.0098	.00975	.4333E-07
		2	.0097	.0095		
18	JP 2	1	.0092	.0088	.00875	.1367E-06
		2	.0087	.0083		
19	JP 3	1	.0096	.0087	.00913	.2425E-06
		2	.0095	.0087		
20	SA 1	1	.0095	.0090	.00925	.8333E-07
		2	.0095	.0090		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-21 (ROBE RIVER)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.0140	.0100	.01100	.4000E-05
		2	.0100	.0100		
22	USA 2	1	.0104	.0106	.01095	.2833E-06
		2	.0113	.0115		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-21 (ROBE RIVER)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	42.629
CHI-SQUARE(.95,35)	49.811

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 2	ZERO WITHIN-BOTTLE VARIANCE
LAB-14	ZERO WITHIN-BOTTLE VARIANCE
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-21	ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-21 (ROBE RIVER)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	17	.82556250E-04	.48562500E-05
BETWEEN BOTTLES	18	.58575000E-05	.32541667E-06
WITHIN BOTTLES	36	.26295000E-04	.73041667E-06
TOTAL	71	.11470875E-03	

F-CALC = .446 F-CRIT(.95;18,36) = 1.899

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-21 (ROBE RIVER)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	64.661
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB-21	C-CALC = .268	C-CRIT(4,22) =	.204
	BOTTLE- 1 REPLICATE- 1	DIXON'S TEST WITHIN LAB-21	
	R10 = 1.000	D-CRIT(4) =	.829
LAB- 7	C-CALC = .209	C-CRIT(4,22) =	.204
LAB- 4	C-CALC = .228	C-CRIT(4,21) =	.212
LAB- 1	C-CALC = .275	C-CRIT(4,20) =	.220
LAB- 8	C-CALC = .321	C-CRIT(4,19) =	.229
LAB-10	C-CALC = .288	C-CRIT(4,18) =	.239

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 1	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 4	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 7	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 8	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-10	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

LAB-21 BOTTLE- 1 REPLICATE- 1 .0140

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 76-21 (ROBE RIVER)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.60261346E-04	.37663341E-05
WITHIN LABS	48	.69125000E-05	.14401042E-06
TOTAL	64	.67173846E-04	

REPEATABILITY VARIANCE	.14401042E-06
REPEATABILITY STD. DEV.	.00037949
BETWEEN-LABORATORIES VARIANCE	.94844327E-06
BETWEEN-LABORATORIES STD. DEV.	.00097388
REPEATABILITY	.00107395
PERMISSIBLE TOLERANCE BETWEEN LABS	.00285879
GRAND MEAN	.00986154
VARIANCE OF THE GRAND MEAN	.59009899E-07

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-1 (STOLLBERG)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.1485	.1385	.14588	.7067E-04
		2	.1566	.1399		
2	AU 2	1	.1388	.1405	.13918	.2942E-05
		2	.1369	.1405		
3	AU 3	1	.1185	.1200	.11950	.1340E-05
		2	.1209	.1186		
4	AU 4	1	.1473	.1478	.14775	.1643E-04
		2	.1529	.1430		
5	CND 1	1	.1582	.1547	.15550	.6327E-05
		2	.1524	.1567		
6	CND 2	1	.1406	.1389	.14063	.1829E-05
		2	.1422	.1408		
7	FR 1	1	.1425	.1213	.13065	.1437E-03
		2	.1394	.1194		
8	FR 2	1	.1382	.1316	.13503	.1066E-04
		2	.1374	.1329		
9	FR 3	1	.1350	.1350	.13825	.1425E-04
		2	.1420	.1410		
10	FR 4	1	.1420	.1440	.14150	.3667E-05
		2	.1400	.1400		
11	FR 5	1	.1427	.1390	.13855	.1138E-04
		2	.1380	.1345		
12	GER 1	1	.1420	.1400	.14225	.4250E-05
		2	.1420	.1450		
13	IND 1	1	.1448	.1422	.14388	.3356E-05
		2	.1460	.1425		
14	IND 2	1	.1500	.1430	.14538	.1023E-04
		2	.1435	.1450		
15	IT 1	1	.1490	.1502	.14995	.4633E-06
		2	.1506	.1500		
16	IT 2	1	.1500		.14250	.1125E-03
		2	.1350			
17	JP 1	1	.1360	.1330	.13525	.2250E-05
		2	.1360	.1360		
18	JP 2	1	.1370	.1277	.13130	.1926E-04
		2	.1325	.1280		
19	JP 3	1	.1324	.1357	.13430	.4980E-05
		2	.1324	.1367		
20	SA 1	1	.1370	.1385	.13813	.2062E-05
		2	.1370	.1400		

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-1 (STOLLBERG)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.1310	.1400	.13575	.5625E-04
		2	.1280	.1440		
22	USA 2	1	.1302		.13100	.3769E-04
		2	.1253	.1375		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-1 (STOLLBERG)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	37.840
CHI-SQUARE(.95,33)	47.407

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

COORNBOS' TEST FOR BOTTLE MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 9	ZERO WITHIN-BOTTLE VARIANCE
LAB-10	ZERO WITHIN-BOTTLE VARIANCE
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-17	ZERO WITHIN-BOTTLE VARIANCE
LAB-22	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-1 (STOLLBERG)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.45829044E-02	.28643153E-03
BETWEEN BOTTLES	17	.75857500E-04	.44622059E-05
WITHIN BOTTLES	34	.10223750E-02	.30069853E-04
TOTAL	67	.56811369E-02	

F-CALC = .148 F-CRIT(.95;17,34) = 1.933

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-1 (STOLLBERG)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	56.771
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB- 7	C-CALC =	.268	C-CRIT(4,22) =	.204
LAB-16	C-CALC =	.286	C-CRIT(4,21) =	.212
LAB- 1	C-CALC =	.252	C-CRIT(4,20) =	.220
LAB-21	C-CALC =	.268	C-CRIT(4,19) =	.229
LAB-22	C-CALC =	.246	C-CRIT(4,18) =	.239

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 1	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 7	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-16	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-21	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-22	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-1 (STOLLBERG)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.41408938E-02	.25880586E-03
WITHIN LABS	51	.34700500E-03	.68040196E-05
TOTAL	67	.44878988E-02	

REPEATABILITY VARIANCE	.68040196E-05
REPEATABILITY STD. DEV.	.00260845
BETWEEN-LABORATORIES VARIANCE	.63000461E-04
BETWEEN-LABORATORIES STD. DEV.	.00793728
REPEATABILITY	.00738192
PERMISSIBLE TOLERANCE BETWEEN LABS	.02306102
GRAND MEAN	.13978235
VARIANCE OF THE GRAND MEAN	.38059686E-05

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-13 (WHYALLA ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.4921	.4867	.48720	.2198E-04
		2	.4890	.4810		
2	AU 2	1	.4668	.4886	.47965	.1242E-03
		2	.4713	.4899		
3	AU 3	1	.5104	.5054	.50598	.1015E-04
		2	.5053	.5028		
4	AU 4	1	.4690	.5170	.49550	.9923E-03
		2	.4680	.5280		
5	CND 1	1	.5351	.5026	.53408	.5257E-03
		2	.5571	.5415		
6	CND 2	1	.4836	.4828	.48303	.2189E-05
		2	.4846	.4811		
7	FR 1	1	.4578	.4475	.45420	.6626E-04
		2	.4640	.4475		
8	FR 2	1	.4691	.4753	.47590	.2467E-04
		2	.4795	.4797		
9	FR 3	1	.4700	.4750	.47425	.8917E-05
		2	.4750	.4770		
10	FR 4	1	.4800	.4820	.48250	.6333E-05
		2	.4820	.4860		
11	FR 5	1	.4844	.4725	.47405	.7302E-04
		2	.4756	.4637		
12	GER 1	1	.4800	.4820	.48275	.4917E-05
		2	.4840	.4850		
13	IND 1	1	.4823	.4849	.47973	.8323E-04
		2	.4662	.4855		
14	IND 2	1	.5150	.5100	.51625	.3958E-04
		2	.5150	.5250		
15	IT 1	1	.4870	.4910	.48650	.1367E-04
		2	.4820	.4860		
16	IT 2	1	.4800		.48500	.5000E-04
		2	.4900			
17	JP 1	1	.4825	.4775	.47863	.6729E-05
		2	.4775	.4770		
18	JP 2	1	.4640	.4350	.44383	.1988E-03
		2	.4430	.4333		
19	JP 3	1	.4549	.4528	.45503	.4282E-05
		2	.4578	.4546		
20	SA 1	1	.4740	.4980	.48450	.1417E-03
		2	.4750	.4910		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-13 (WHYALLA ORE)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
21	USA 1	1	.4270	.4750	.45100	.7680E-03
		2	.4270	.4750		
22	USA 2	1	.4446	.4575	.44537	.1385E-03
		2	.4340			

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-13 (WHYALLA ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	65.591
CHI-SQUARE(.95,39)	54.581

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE

NONE REJECTED

DOORNBOS' TEST FOR BOTTLE MEANS

LAB- 5 BOTTLE- 2 T-CALC = 3.651 T-CRIT(.00125,38) = 3.487

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB- 5	DOORNBOS' TEST FOR BOTTLE MEANS
LAB-16	NUMBER OF BOTTLES OR REPLICATES INCORRECT
LAB-22	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-13 (WHYALLA ORE)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	18	.23386973E-01	.12992763E-02
BETWEEN BOTTLES	19	.53044500E-03	.27918158E-04
WITHIN BOTTLES	38	.72422900E-02	.19058658E-03
TOTAL	75	.31159708E-01	

F-CALC = .146 F-CRIT(.95;19,38) = 1.867

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-13 (WHYALLA ORE)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	76.159
CHI-SQUARE(.95,21)	32.678

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

LAB- 4	C-CALC =	.300	C-CRIT(4,22) =	.204
LAB-21	C-CALC =	.332	C-CRIT(4,21) =	.212
LAB- 5	C-CALC =	.340	C-CRIT(4,20) =	.220

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

LAB- 4	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB- 5	COCHRAN'S TEST FOR LABORATORY VARIANCE
LAB-21	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 79-13 (WHYALLA ORE)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	18	.22551803E-01	.12528779E-02
WITHIN LABS	54	.28187417E-02	.52198920E-04
TOTAL	72	.25370544E-01	

REPEATABILITY VARIANCE	.52198920E-04
REPEATABILITY STD. DEV.	.00722488
BETWEEN-LABORATORIES VARIANCE	.31278593E-03
BETWEEN-LABORATORIES STD. DEV.	.01768575
REPEATABILITY	.02044642
PERMISSIBLE TOLERANCE BETWEEN LABS	.05209702
GRAND MEAN	.47783425
VARIANCE OF THE GRAND MEAN	.17443143E-04

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 80-1 (EURO-STANDARD 680-1)

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.1776	.1685	.16950	.3182E-04
		2	.1673	.1646		
2	AU 2	1	.1660	.1650	.16598	.4825E-06
		2	.1663	.1666		
3	AU 4	1	.1712	.1725	.17313	.2689E-05
		2	.1750	.1738		
4	CND 1	1	.1856	.1771	.17905	.2190E-04
		2	.1788	.1747		
5	CND 2	1	.1661	.1649	.16545	.2700E-06
		2	.1656	.1652		
6	FR 1	1	.1644	.1603	.16618	.3522E-04
		2	.1656	.1744		
7	FR 2	1	.1662	.1601	.16458	.1185E-04
		2	.1639	.1681		
8	FR 3	1	.1650	.1670	.16475	.4250E-05
		2	.1620	.1650		
9	FR 4	1	.1660	.1650	.16500	.6667E-06
		2	.1650	.1640		
10	FR 5	1	.1630	.1606	.16115	.2650E-05
		2	.1592	.1618		
11	GER 1	1	.1620	.1640	.16350	.1000E-05
		2	.1640	.1640		
12	IT 1	1	.1690	.1700	.16943	.1892E-06
		2	.1695	.1692		
13	JP 1	1	.1640	.1640	.16475	.4917E-05
		2	.1630	.1680		
14	JP 2	1	.1546	.1546	.15550	.1107E-05
		2	.1566	.1562		
15	JP 3	1	.1533	.1551	.15400	.6533E-06
		2	.1541	.1535		
16	SA 1	1	.1625	.1653	.16328	.6509E-05
		2	.1600	.1653		
17	USA 1	1	.1650	.1740	.16950	.2167E-04
		2	.1660	.1730		
18	USA 2	1	.1479	.1600	.15420	.4502E-04
		2	.1489	.1600		

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 80-1 (EURO-STANDARD 680-1)

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	34.157
CHI-SQUARE(.95,29)	42.565

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

LAB-11	ZERO WITHIN-BOTTLE VARIANCE
LAB-13	ZERO WITHIN-BOTTLE VARIANCE
LAB-14	ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: 80-1 (EURO-STANDARD 680-1)

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	14	.22993823E-02	.16424160E-03
BETWEEN BOTTLES	15	.15656500E-03	.10437667E-04
WITHIN BOTTLES	30	.40092000E-03	.13364000E-04
TOTAL	59	.28568673E-02	

F-CALC = .781 F-CRIT(.95;15,30) = 2.015

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 14B - PB/ZN AAS METHOD - ZINC
SAMPLE: 80-1 (EURO-STANDARD 680-1)

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	55.799
CHI-SQUARE(.95,17)	27.593

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE

NONE REJECTED

DIXON'S TEST FOR LABORATORY MEANS

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

ALL RESULTS WERE USED EXCEPT INDIVIDUAL REPLICATES LISTED BELOW

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 148 - PB/ZN AAS METHOD - ZINC
SAMPLE: BC-1 (EURO-STANDARD 680-1)

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	17	.26968361E-02	.15863742E-03
WITHIN LABS	54	.57855500E-03	.10713981E-04
TOTAL	71	.32753911E-02	

REPEATABILITY VARIANCE	.10713981E-04
REPEATABILITY STD. DEV.	.00327322
BETWEEN-LABORATORIES VARIANCE	.36980859E-04
BETWEEN-LABORATORIES STD. DEV.	.00608119
REPEATABILITY	.00926322
PERMISSIBLE TOLERANCE BETWEEN LABS	.01841411
GRAND MEAN	.16493889
VARIANCE OF THE GRAND MEAN	.22032975E-05